Conflict Analysis Based on Rough Set in E-commerce

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Abstract

A new conflict analysis model based on the rough set theory is developed in this paper to solve the dispute among agents in e-commerce. The strategic conflict is a situation in which two or more agents have to make independent choices in face of differing interests about possible outcomes for the agents. Among the formal methodologies that handle strategic conflict, DEJA model and PAWLAK model are two effective methods based on the rough set theory for conflict analysis. In this paper, the extended DEJA model is proposed and employed to model and analyze a conflict of e-commerce between consumer and seller.

Keywords

E-commerce; Conflict Analysis; Pawlak Model; TOPSIS

Introduction

Conflict represents an inverse state existing between two or more parties who are in dispute over some issues. Conflicts inevitably arise whenever human beings interact with one another in the course of managing their daily affairs (Amer, 2009). For example, family members may argue over which car to buy, governments must face the conflict between increasing economy and protecting environment, and so on. Conflicts arise naturally in any level of human relationships (Luai, 2006): environment management, international relations, economic competition and relationships among individuals. Going along with the development of Internet, conflicts thus appear in e-commerce and online shopping. How to find an optimal solution for the conflict is very important. There've been many conflict resolution tools, such as: Game Theory (Von, 1944), Metagame Analysis (Howard, 1971), Conflict Analysis (Fraser, 1984), Theory of Moves (Brams, 1994), and the Graph Model for Conflict Resolution (Fang, 1993. Kilgour, 2005). Compared with the aforementioned conflict models, the Pawlak model (Pawlak, 1998, 2005) and extended Pawlak model called DEJA model (Deja, 2002) are easy for computer implementation and seem adequate for many applications in real life.

Electronic commerce (e-commerce) has existed for over 40 years, originating from the electronic transmission of messages during the Berlin airlift in 1948 and is subdivided into: B2B (business to business), B2C (Business to Consumer), B2G (Business to Government), G2G (Government to Government), and C2C (Customer to Customer). However, until now, we cannot find an exact definition of e-commerce. e-commerce is a commercial application using internet that has grown fast and widely been used. It is a new means of business that is based on electronics and electronic technology. It has broken the tangible and intangible barriers of countries and regions to help manufacturers approach globalization, networking, personalization. e-commerce activities basically include trading market, electronic currency exchange, supply chain management, Internet marketing, transaction processing. Or simply, e-commerce refers to various online commercial activities, focusing on commodity exchanges by electronic means by companies, factories, enterprises, industrial undertakings and consumers. Economists have theorized that e-commerce ought to lead to intensified price competition, as it increases consumers' ability to gather information about products and prices. It has grown in importance as manufacturers have adopted Pure-Click and Brick-and-Click Channel system. Compared with traditional ways, e-commerce holds two particular features: the timeliness of information and interactive virtualization. Except for digital communication, there's no other interaction that substantially directs face-to-face. This is called interactive virtualization. The timeliness of information means that consumers are able to update goods and services information on time so that they can analyze market, consult, and achieve seller's information and then purchase. It's far more important than just to trade online. e-commerce is expected to shorten the boundary of time and space, alter the trade pattern, and improve the circulation of

merchandize, capital and information. It not only enables the traditional business to achieve greater, faster, better and more economical results but also makes a profound impact on each aspect of human society such as production and employment, working talent, and so on (Zheng, 2009).

By the convenience brought by internet-working and available information, people now spend more and more time doing on the electronic medium, especially focusing on online shopping. In the process of online shopping, consumer is the one who wishes to purchase a product with an accepTABLE price, high quality, best service and seller's good credibility. However, for seller, his expectation is high revenue. Conflicts between consumer and seller appear when their goals are different. In order to improve e-commerce further, it is an interesting topic to find a better way to solve these conflicts between consumer and seller. The value function is an important element for conflict analysis. Usually, the value function is determined by experts based on their own subjectivity. In the real world conflict, it's really difficult for player to give out a specific number to evaluate a state. To avoid the subjectivity, the degree of nearness is used to evaluate each agent' state in this paper.

The rest of the paper is organized as follows: Section Ⅱ presents the basic concepts of Pawlak model. The extended conflict model is constructed in section Ⅲ. Subsequently, we will analyze the conflict using extended model in order to understand the e-commerce dispute between consumer and seller. Conclusions with some comments are the ending of this paper.

Basis Concepts of Pawlak Model

The Pawlak Model was first proposed in 1982 by Z. Pawlak as one of useful conflict resolution tools that is based on some ideas of rough set theory (Pawlak, 1982). Pawlak model has been conceived as an objective mathematical tool to deal with vague or imprecise information (Pawlak, 2005). In Pawlak model, the lower and upper approximation operators are based on equivalence relation. However, the requirement of an equivalent relation in this model seems to be a very restrictive condition that may limit the applications of the rough sets models (Pawlak, 1991, 1998).

In the Pawlak conflict model, the information system is a pair $S=(U,A)$, where $U=\{u_1,u_2,\cdots u_n\}$ is a non-empty, finite set called the universe, elements of $U=\{u_1,u_2,\cdots u_n\}$ are called objects and $A=\{a_1,a_2\cdots a_m\}$ is a non-empty, finite set of attributes. Every attribute $a\in A$ is a total function $a:U\to V_a$ where V_a is the set of values of a.

It is assumed that we have a finite set of objects described by a finite set of attributes. The values of objects on attributes can be conveniently represented by an information TABLE. Decision TABLEs are one type of information TABLEs with a decision attribute that gives the decision classes for all objects.

In Pawlak model, the domain of each attribute is restricted to three values: -1, 0 and 1 which represent against, neutral, and favorable, respectively. In order to express relations between agents, there are three basic binary relations on the universe: conflict, neutrality and alliance (Pawlak, 2005) as follows:

$$\phi_a=\begin{cases}1 \;\; if \;\; a(x)a(y)=1 \; or \; x=y \\ 0 \;\; if \;\; a(x)a(y)=0 \; or \; x\neq y \\ -1 \; if \;\; a(x)a(y)=-1\end{cases}$$

If $\phi_a(x,y)=1$, agents x and y have the same opinion about issue a (are allied on a); if $\phi_a(x,y)=0$, it means at least one agent x or y has neutral approach to issue a (is neutral on a), and if $\phi_a(x,y)=-1$, it means that both agents have different opinions about issue a (are in conflict on a).

In the system, the attitude of agents is based on the total function, and that's the high level resolution, but it could not provide more detailed information. The causes of conflict are unknown. Meanwhile, it's not easy to find a conflict resolution that can be accepted by all agents. Therefore, in 2002, Deja [11] expanded the Pawlak conflict model to an improved model called the DEJA model. The model based on the rough set and Boolean reasoning ways specifies conflicts and transforms the conflict problem into the Boolean-reasoning problem. But in the DEJA model, the Boolean reasoning is very complex and not easy to find a scheme that can satisfy all people.

In the latter part we not only expand Pawlak model based on its own basic theory but also simplify the algorithm. The extended model and resolution process are shown in the next section.

The Extended Pawlak Model

DEJA Conflict Model (Deja, 2002)

The information of an employee is presented in TABLE 1.

The fist column of TABLE 1 represents employee's states. We use 0, 1, and 2 to represent the level of salary and job condition that are "low", "medium" and "high", respectively. The subjective evaluation of the employee toward each state is presented in the last column in which "1" means very preferred, "0" means very unsatisfied.

On the Deja model, all evaluations that player in this case has made are based on his own subjectivity. In the real world conflict, it's really difficult for player to give out a specific number to evaluate a state. This article focuses on this idea using by the degree of nearness, to avoid the subjectivity of the player.
In this paper, we will use two methods—TOPSIS and Max-min approach to evaluate states and compare these two methods.

TABLE 1 LOCAL STATES OF EMPLOYEE WITH SUBJECTIVE EVALUATION

Local states	Salary	Job condition	evaluation
S1	2	2	1
S2	2	1	2/3
S3	1	2	1/3
S4	1	1	0
S5	2	0	0

TOPSIS and Max-min Approach

Evaluate States with TOPSIS

TOPSIS (Techniques for Order Preference by Similarity to Ideal Solution) was developed by HW and Yoon (Huang, 1981) to solve the multiple criteria decision-making problem. The principle of the TOPSIS is that the chosen alternative should be as close to the ideal solution as possible and as far from the negative-ideal solution as possible.

For any agent of the conflict system, there always exists in the ideal state and the negative-ideal state. For any case, if there's a state that is close to the ideal state and the state which is distant from the negative ideal state, then agent will be more satisfied, and the relative closeness to the ideal solution will be bigger. The TOPSIS method consists of the following steps:

● Establish agent's initial decision matrix. Suppose that for agent, there are m states and n disputes, the initial decision matrix is as follows:

$$V = (v_{ij})_{m\times n} = \begin{bmatrix} v_{11} & v_{12} & \cdots & v_{1n} \\ v_{21} & v_{22} & \cdots & v_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ v_{m1} & v_{m2} & \cdots & v_{mn} \end{bmatrix}$$

Where, $v_{ij}(i=1,2,\cdots m;\, j=1,2,\cdots n)$ represents the value that the agent evaluates state s_i at the dispute a_j. For example, v_{11} represents the value that the agent evaluates state s_1 at the dispute a_1. In this paper, we suppose $v_{ij}=(0,1,2)$.

● Determine the ideal solution and the negative-ideal solution.

For benefit criteria (dispute) the agent wants to have maximum values among states and for cost criteria he wants to minimize values among them. So the ideal solution S^+ and the negative-ideal solution S^- will be:

$$S^+ = \{V_1^+, V_2^+, \cdots V_n^+\} = \{(\max_j v_{ij} \mid i \in I'), (\min_j v_{ij}) \mid i \in I''\} \tag{1}$$

$$S^- = \{V_1^-, V_2^-, \cdots V_n^-\} = \{(\min_j v_{ij} \mid i \in I'), (\max_j v_{ij}) \mid i \in I''\} \tag{2}$$

Where I' is associated with benefit criteria, and I'' is associated with cost criteria.

● Calculate the separation measures

Using the n-dimensional Euclidean distance, the separation of each state from the ideal solution is given as:

$$d(s_i, S^+) = d_i^+ = \sqrt{\sum_{j=1}^{n}(v_{ij} - V_j^+)^2}, (i=1,2,\cdots,m) \tag{3}$$

Similarly, the separation from the negative-ideal solution is given as:

$$d(s_i, S^-) = d_i^- = \sqrt{\sum_{j=1}^{n}(v_{ij} - V_j^-)^2}, (i=1,2,\cdots,m) \tag{4}$$

● Calculate the relative closeness to the ideal solution

The relative closeness of state S with respect to the ideal solution is defined by:

$$C_i = \frac{d_i^-}{d_i^- + d_i^+}, (i=1,2,\cdots,m) \tag{5}$$

The interval of the degree of nearness is $0 \le C \le 1$, the closer C approaches to 1, and the more excellent that state will be.

Remark: The normalized decision matrix and the weight of attribute (dispute) are not considered. First reason is that, the values of disputes are limited by using only three numbers 2, 1, and 0. And the second one, to simplify, all weights of disputes are set to be equivalent.

Evaluate states by max-min relative closeness to the ideal solution.

Assume $A=(a_1,a_2,\cdots,a_n)$, $B=(b_1,b_2,\cdots,b_n)$ then we can define the max-min relative closeness between series A and series B (Yuan, 2010).

$$C(A,B)=\frac{\sum_{j=1}^{n}(A(a_j)\wedge B(b_j))}{\sum_{j=1}^{n}(A(a_j)\vee B(b_j))} \tag{6}$$

Definition 1: Where "$\wedge$" and "$\vee$" mean to take the smaller or greater value, respectively.

The above max-min relative closeness should satisfy three following properties:

(1) $C(A,B)=C(B,A)$

(2) $C(A,A)=C(A,A)$

(3) $C(A,\Phi)=0$

Especially, for any agent, the max-min relative closeness between s_i and S^+ is defined as:

Definition 2: (max-min relative closeness to the ideal solution)

$$C(s_i,S^+)=C_i^*=\frac{\sum_{j=1}^{n}((v_{ij})\wedge(S^+))}{\sum_{j=1}^{n}((v_{ij})\vee(S^+))} \tag{7}$$

Similarly, C^* also needs to meet properties mentioned above. From Eq.7, we can see clearly that $C^*\in[0,1]$, the closer C^* approaches to 1, the more excellent that state will be.

The Extended DEJA Model

Definition 3: (The information system of agent) In the conflict system $S=(U,A)$, $U=\{u_1,u_2\cdots,u_n\}$ is the set of agents $(n\geq 2)$, $A=\{a_1,a_2\cdots,a_m\}$ is the set of attributes. For arbitrary set of attributes $ag\in U$, another set of attributes $B=(b_1,b_2\cdots b_l)\subseteq A$, let $I_{ag}=(U_{ag},B)$ be the information system of agent. Let $U_{ag}=\{s_{ag}^1,s_{ag}^2,\cdots s_{ag}^m\}$ be m sets of alternatives that represents agent. We use vector $f_{ag}(s_{ag}^i,b_1), f_{ag}(s_{ag}^i,b_2),\cdots f_{ag}(s_{ag}^i,b_l)$ to indicate alternative s_{ag}^i, where f_{ag} is information function:

$$f_{ag}:U_{ag}\times B\rightarrow \bigcup_{b\in B}V_b$$

V_b is the value of attribute b (the value after discretization).

Definition 4: (Agent's partly feasible states) In the conflict system, $S=(U,A)$, $I_{ag}=(U_{ag},B)$ is defined as the information system of agent, and the agent's collection of states of the relative closeness to the ideal solution as $C_{ag}:C_{ag}\in[0,1]$. Given the threshold $\lambda_{ag}\in[0,1]$, if $C_{ag}(s_{ag}^i)\geq\lambda_{ag}$ then the state s_{ag}^i is said to be feasible state. All sets of feasible states are:

$\overline{U}_{ag}=\{s_{ag}^i:C_{ag}(s_{ag}^i)\geq\lambda_{ag},s_{ag}^i\in U_{ag}\}$. Each agent has his own consideration about feasible states, yet, they are interactive and dependent in the whole system. Therefore, it's necessary to define Global conflict system and Global feasible states.

Definition 5: (Global conflict system) In the conflict system $S=(U,A)$, $U=\{u_1,u_2\cdots,u_n\}$ is a set of agents $(n\geq 2)$, $A=\{a_1,a_2\cdots,a_m\}$ is a set of disputes. $I=(G,A)$ is defined as information system of the conflict system, where $G=\{g_1,g_2\cdots g_h\}$ represents global set of states. Use vector $f_g(g_i,a_1), f_g(g_i,a_2),\cdots f_g(g_i,a_k)$ to denote state g_i , where f_g is information function, $f_g:U\times A\rightarrow\bigcup_{a\in A}V_a$, V_a is the value of dispute a (the value after discretization).

Definition 6: (Global feasible states) In the conflict system, $S=(U,A)$, $I=(G,A)$ is defined as information system of the conflict system, defined the relative closeness to the ideal solution of the whole state system as $C_g:C_g\in[0,1]$. Set threshold $\lambda_g\in[0,1]$,if $C_g(g_i)\geq\lambda_g$ then state g_i is said to be global feasible state. The collection of all feasible states is: $\overline{G}=\{g_i:C_g(g_i)\geq\lambda_g,g_i\in G\}$.

To be conflict system, disputes are relevant, and therefore, all disputes have certain constraints.

Set $h(a_1,a_2,\cdots a_n)$ as a constraint of all disputes in the conflict system $S=(U,A)$, if there exists the global state $g_i=f_g(g_i,a_1), f_g(g_i,a_2),\cdots f_g(g_i,a_n)$ to make $h(f_g(g_i,a_1), f_g(g_i,a_2),\cdots f_g(g_i,a_n))$ meaningful. Then the whole state g_i should be satisfied the constraint $h(a_1,a_2,\cdots a_n)$, otherwise, this state is not satisfied the constraint.

While solving the optimal equilibrium solution, except for satisfying the constraint condition mentioned above, in order to enable the optimal equilibrium state to be accepted by agents, the optimal solution must include all feasible states of agents.

The process of solving conflict to find optimal solution using the extension of DEJA model as follows:

Step 1: For any agent $ag\in U$, $I_{ag}=(U_{ag},B)$ and the given threshold $\lambda_{ag}\in[0,1]$,first estimate feasible states $\overline{U}_{ag}$, if $\overline{U}_{ag}=\Phi$, then lower threshold until $\overline{U}_{ag}\neq\Phi$ is met.

Step 2: Use $I=(G,A)$ and the given threshold $\lambda_g \in [0,1]$ to calculate all sets of global feasible states. If $\overline{G}=\Phi$, then lower threshold until $\overline{G}\neq\Phi$ is satisfied.

Step 3: For $\forall g \in \overline{G}$, and $\forall ag \in U$, there exists in $s_{ag} \in g$ and g satisfies constraints $h(a_1,a_2,\cdots a_n)$ then $\overline{\overline{G}}=\cup\{g\}$. The optimal solution $\overline{\overline{G}}$ is found if $\overline{\overline{G}}\neq\Phi$. In case $\overline{\overline{G}}=\Phi$, lower threshold $\lambda_g \in [0,1]$ and then repeat all process from step 1 to step 3 until $\overline{\overline{G}}\neq\Phi$ is met.

Case Study: Conflict Analysis in E-Commerce

Feasible States of Agents

The information of consumer is shown in TABLE 2. For consumer, price, quality and services are items they care the most. Services here refer to transaction security, seller's reliability, delivery speed and so on. In this paper, the range value of all components is set as $V_a=\{0,1,2\}$. As the information shown in TABLE 2, in terms of price, 2, 1, and 0 represent for high, medium and low level (Use in a similar way to set for quality and services). For example, the state S1 expresses a "high" level of price, "high" level of quality and "high" level of services.

TABLE 2 LOCAL STATES OF CONSUMER

Consumer (U1)	Price(a)	Quality(b)	Services(c)
S1	2	2	2
S2	2	2	1
S3	2	1	2
S4	2	1	1
S5	1	2	2
S6	1	2	1
S7	1	2	0
S8	1	1	2
S9	1	1	1
S10	0	1	0
S11	0	0	1
S12	0	0	0

For seller, what they care the most are profit, capital investment and consumer's satisfaction. Capital investment refers to the investment that seller uses to improve consumer's attention and expand scale of site. Let 2, 1, and 0 represent for high, medium and low level of profit (Use in a similar way to set for capital investment and consumer's satisfaction). All sellers' states are listed in the first column of TABLE 3.

All information of seller is listed in TABLE 3.

TABLE 3 LOCAL STATES OF SELLER

Seller(U2)	Profit(d)	Capital Investment(e)	Customer satisfaction(f)
S1	2	2	2
S2	2	2	1
S3	2	1	2
S4	2	1	1
S5	2	0	1
S6	1	1	2
S7	1	1	1
S8	1	0	2
S9	1	0	1

The Relative Closeness to the Ideal Solution

For consumer, what they expect in product they buy is at low price, good quality and good services, so the ideal solution is set as $S^+=(V_1^+,V_2^+,V_3^+)=(0,2,2)$ .and what they don't expect the most is at high price, bad quality and bad services, and then the negative-ideal solution is set as $S^-=(V_1^-,V_2^-,V_3^-)=(2,0,0)$. The first row of TABLE 4 shows the relative closeness to the ideal solution of every state. For consumer, the threshold value is set $\lambda_{ag}=0.6$, and then the set of feasible states is $\overline{U}_{ag}=\{s_5,s_6,s_8\}$.

The Max-min Relative Closeness to the Ideal Solution

The max-min relative closeness to the ideal solution can be estimated by using Eq.7.

For instance, for $s_5=\{1,2,2\}$, the max-min relative closeness to $S^+=(V_1^+,V_2^+,V_3^+)=(0,2,2)$ is:

$$C(s_5,S^+)=C_5^*=\frac{(1\wedge 0)+(2\wedge 2)+(2\wedge 2)}{(1\vee 0)+(2\vee 2)+(2\vee 2)}=\frac{4}{5}=0.8$$

TABLE 4 THE RELATIVE CLOSENESS TO THE IDEAL SOLUTION FOR CONSUMER

Method	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
(1)	0.58	0.5	0.5	0.37	0.75	0.63	0.5	0.63	0.5	0.5	0.5	0.41
(2)	0.67	0.5	0.5	0.33	0.8	0.6	0.4	0.6	0.4	0.25	0.25	0

TABLE 5: THE RELATIVE CLOSENESS TO THE IDEAL SOLUTION FOR SELLERS

Method	S1	S2	S3	S4	S5	S6	S7	S8	S9
(1)	1	0.75	0.75	0.63	0.5	0.63	0.5	0.5	0.37
(2)	1	0.83	0.83	0.67	0.5	0.67	0.5	0.5	0.33

The max-min relative closeness to the ideal solution is shown in the second row of TABLE 4. The threshold value is set $\lambda_{ag} = 0.6$, and then the set of feasible states is $\overline{U}_{ag} = \{s_1, s_5, s_6, s_8\}$.

Among all partly feasible states, only the results of state s_1 are different. State s_1 shows that consumer purchases at a high price with good quality and good services. It's reasonable with our real situation. So, state s_1 is supposed to be feasible state.

For seller, the higher the profit, capital investment and consumer's satisfaction are the better it is. Therefore, the ideal solution is $S^+ = (V_1^+, V_2^+, V_3^+) = (2,2,2)$, when all three dispute factors are bad, it will become the negative-ideal solution, which is $S^- = (V_1^-, V_2^-, V_3^-) = (0,0,0)$. Based on the formula of the third part, we can find the relative closeness to the ideal solution of every state, shown in the TABLE 5. For seller, the threshold value is 0.6. The set of seller's feasible solutions is $\overline{U}_{ag} = \{s_1, s_2, s_3, s_4, s_6\}$.

Feasible States of Conflict System

The information system of the whole conflict is shown in TABLE 6, in which a, b, c, d, e, f represent price, quality, services, profit, capital investment and customer satisfaction, respectively. The ideal solution is

$$S^+ = (V_1^+, V_2^+, V_3^+, V_4^+, V_5^+, V_6^+) = (0,2,2,2,2,2)$$

and the negative-ideal solution is

$$S^- = (V_1^-, V_2^-, V_3^-, V_4^-, V_5^-, V_6^-) = (2,0,0,0,0,0)$$

Based on the formula of the third part, we can find the relative closeness to the ideal solution of every state in the conflict system in TABLE 7. The threshold is found as $\lambda_g = 0.6$, and then the set of Global feasible state is: $\overline{G} = \{s_1, s_2, s_3, s_4, s_9, s_{10}, s_{11}, s_{12}, s_{13}, s_{14}, s_{15}, s_{17}, s_{18}, s_{20}, s_{21}, s_{22}\}$.

TABLE 6: FEASIBLE STATES OF CONFLICT SYSTEM

	a	b	c	d	e	f
g1	2	2	2	2	2	2
g2	2	2	2	2	1	2
g3	2	2	1	2	2	1
g4	2	1	2	2	2	1
g5	2	1	1	2	2	0
g6	2	2	1	2	1	1
g7	2	1	2	2	1	1
g8	2	1	1	2	1	0
g9	1	2	2	1	1	2
g10	1	2	2	1	0	2
g11	1	1	2	2	2	2
g12	1	2	1	2	2	2
g13	1	1	1	2	2	1
g14	1	1	2	2	1	2
g15	1	2	1	2	1	2
g16	1	1	1	2	1	1
g17	1	1	2	1	1	2
g18	1	2	1	1	1	2
g19	1	1	1	1	1	1
g20	1	1	2	1	1	2
g21	0	1	1	1	1	2
g22	0	1	2	1	0	2
g23	0	1	1	1	0	2

By using max-min relative closeness to the ideal solution and TOPSIS, we acknowledge that although the results are almost the same but it seems like TOPSIS holding holds more advantages than then the max-min relative closeness to the ideal solution. The reasons are:

- The degree of closeness is measured by terms of distances. Although there's objectivity, however it may cause the omission.

- Comparing with these two methods, when values are gathered, the differences are low. Classification is not exact if the threshold value is rather big.

TABLE 7: THE RELATIVE CLOSENESS TO THE IDEAL SOLUTION FOR WHOLE SYSTEM

Method	g 1	g 2	g 3	g 4	g 5	g 6	g 7	g 8	g 9	g 10	g 11	g 12
（1）	0.69	0.65	0.60	0.60	0.5	0.56	0.56	0.44	0.69	0.6	0.75	0.75
（2）	0.83	0.75	0.67	0.67	0.5	0.58	0.58	0.42	0.73	0.64	0.82	0.82

Method	g 13	g 14	g 15	g 16	g 17	g 18	g 19	g 20	g 21	g 22	g 23
（1）	0.63	0.69	0.69	0.57	0.63	0.63	0.5	0.63	0.63	0.6	0.56
（2）	0.64	0.73	0.73	0.55	0.64	0.64	0.46	0.64	0.6	0.6	0.5

Optimal Solutions

The optimal states not only include all feasible states of agents but also need to satisfy all constraints of attributes (disputes) in the conflict system.

(1)State $g_3=(2,2,1,2,2,1)$, as there doesn't exist in $s_{u_1}\in g_3$.

(Consumer's feasible state is not included in the Global feasible states), so, $g_3\notin\overline{\overline{G}}$, similarly, we can get $\{g_4,g_5,g_6,g_7,g_8,g_{10},g_{13},g_{16},g_{19},g_{21},g_{22},g_{23}\}\not\subset\overline{\overline{G}}$ .The Global feasible states that satisfy all agents' feasible states are listed in TABLE 8.

TABLE 8: GLOBAL FEASIBLE STATES FOR THE TWO AGENTS

	a	b	c	d	e	f
g1	2	2	2	2	2	2
g2	2	2	2	2	1	2
g9	1	2	2	1	1	2
g11	1	1	2	2	2	2
g12	1	2	1	2	2	2
g14	1	1	2	2	1	2
g15	1	2	1	2	1	2
g17	1	1	2	1	1	2
g18	1	2	1	1	1	2
g20	1	1	2	1	1	2

(2)Constraints listed below may restrict the set of situations.

The attribute named here refers to the variables corresponding to attribute values. Constraints have been made based on practical experiment to illustrate the relationships.

Seller's profit and price are closely interactive. The higher the price is, the more profit the seller can earn.

When seller considers the capital investment to attract consumer's attention and expand the scale of site, he needs to think over the profit. So, that is $1+\mathit{profit}>\mathit{price}+\mathit{captial\ invesment}$.

Consumer's satisfaction comes from the quality and services that online shop provides. That is $\mathit{quality}+\mathit{services}>\mathit{consumer's\,satisfaction}$.

After satisfying all constraints, we can get the optimal states.

State $g_1=(2,2,2,2,2,1)$ doesn't meet constraint 1 (as 1+2<2+2), therefore $g_1\notin\overline{\overline{G}}$, similarly $\{g_2,g_9,g_{11},g_{12},g_{17},g_{18},g_{20}\}\not\subset\overline{\overline{G}}$ is found, thus the optimal states are $\{g_{14}=(1,1,2,2,1,2),g_{15}=(1,2,1,2,1,2)\}$ .State g_{14} is the one with medium level price, medium level quality, good service, high level of seller's profit, medium level of capital investment, high level of consumer's satisfaction. State g_{15} is the one with medium level of price, high level of quality, medium level of services, high level profit, and medium level of capital investment and high level of consumer's satisfaction.

Conclusions

In this paper, a new conflict model based on DEJA model is introduced to handle dispute among agents. The information system, the accepted scheme of each agent and the whole system, and constraint of dispute factors were introduced in the new model.

Based on the idea of TOPSIS, the relative closeness to the ideal solution and max-min relative closeness to the ideal solution were used to replace agents' subjective evaluation and thus resulted in the equilibrium of the conflict system. Compared with the DEJA model which transforms the conflict resolving problem into the Boolean-reasoning, our extended model offers the advantages of easy calculation, and the algorithm provides agents a more flexible mechanism for conflict analysis. Illustrative examples of dispute between consumer and seller in E-commerce demonstrate how the new model can be applied to analyze conflicts and solve dispute.

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